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1,1,2-TRICHLOROETHANE

CATEGORIZATION AS A HAZARDOUS WASTE

THE PROPOSAL

The Ontario Ministry of the Environment administers the *Environmental Protection Act*. Schedule 1 of Regulation 309 made under this act lists some industrial processes in which hazardous wastes are generated. Waste streams from these processes typically have a high concentration of hazardous chemicals.

The Ministry is proposing to categorize wastes from industrial processes using 1,1,2-trichloroethane as a solvent as "hazardous industrial wastes". This would be done by listing these processes in Schedule 1 of the regulation.

Companies using such processes would then be required to comply with the provisions of Regulation 309 concerning the disposal of hazardous wastes.

Those firms generating waste from the manufacture, distribution, or storage of the chemical are already subject to the provisions of the regulation because it is now listed in Schedule 2, as a "hazardous waste chemical".

For an explanation of the two ways, categorization and review in which the schedules in the Regulation may be updated you are referred to the Ministry's publication, *A Guide to Hazardous Waste Categorization and Review*.

1,1,2-trichloroethane is also known under the trade name Beta-7 or as ethane trichloride, beta-trichloroethane, 1,2,2-trichloroethane, or vinyl trichloride.

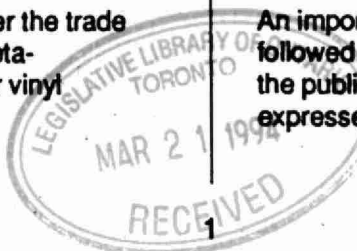
THE CATEGORIZATION PROCEDURE

The updating of a Schedule by categorization begins with an application in writing to the hazardous waste review unit (HWRU), at the Waste Management Branch, Ministry of the Environment. Applications may come from agencies having regulatory responsibility for health and the environment, from concerned organizations, or from the public at large.

Upon receipt of an application the HWRU prepares a Categorization Background Document. This document provides an extensive evaluation of the data on the toxicity of the contaminant in question, and on its potential impact on human health and on the environment. If in the opinion of the HWRU there are sufficient grounds to proceed further, the application is evaluated by the hazardous waste review committee (HWRC), consisting of representatives of the Waste Management Branch, other Ministry of the Environment branches, and the Ontario Ministry of Labour. It may also be circulated to other environmental services branches within the Ministry for technical evaluation. Following this evaluation the HWRC submits a recommendation for approval to the director of the Waste Management Branch.

If the case is considered to be urgent, the approved recommendation is forwarded directly to the Minister of the Environment, who makes the final decision.

An important part of the categorization procedure followed in less urgent cases is full consultation with the public before any final action is taken. Opinions expressed as a result of this consultation will be



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reviewed, together with the recommendation of the internal committee and other information, by an independent Hazardous Waste Advisory Committee. This committee, made up of persons from the scientific and academic communities and from public interest groups, makes the final recommendation to the Minister of the Environment regarding the proposed categorization.

Selected properties of 1,1,2-trichloroethane

Chemical formula : $C_2H_3Cl_3$
Density : 1.44 g/cc
Melting point : $-37^{\circ}C$
Boiling point : $113.5^{\circ}C$
Solubility : 4.5 g/l in water at $20^{\circ}C$
Flammability : not ignitable
Volatility : vapour pressure 16.73 mm Hg at $20^{\circ}C$

USES

1,1,2-trichloroethane is used as a medium in which a reaction can take place between materials dissolved in it, or to extract a soluble component or components from a mixture. Some of the industrial uses include:

- Production of cellulose acetate, rubber and oils;
- Manufacture of polyesters;
- Extraction of vegetable oils;
- Production of fats, waxes, natural resins and alkaloids.

It is also used as a cleaning and degreasing agent in solvent mixtures.

PRODUCTION

1,1,2-trichloroethane is not produced in Canada but 24.0 tonnes of the solvent were imported into this country in 1987. In the United States two production processes are in use. Most of the material comes from the chlorination of ethylene to produce the intermediate, 1,2-dichloroethane, which is then further chlorinated to 1,1,2-trichloroethane. In a second, and less used process, acetylene gas is reacted with a mixture of hydrogen chloride and chlorine in the presence of a catalyst.

1,1,2-TRICHLOROETHANE AS A WASTE

From all of the manufacturing processes in Ontario in which 1,1,2-trichloroethane is used, it is estimated that about sixty per cent of it enters the waste stream. As of 1987 this constituted about 5 tonnes. Wastes are treated by distillation and about 94 per cent of the chemical is recovered for re-use. The residue of the recovery process, about 0.3 tonne of "still bottoms", must be disposed of as industrial waste.

HEALTH HAZARDS OF 1,1,2-TRICHLOROETHANE

The Ministry of the Environment uses a rating system to assess the different types of hazard to human health from toxic substances. This assigns a score from zero, representing no risk, to ten for maximum risk for each hazard, based on the results of laboratory tests. If the score is above a given level, referred to as the concern level the substance is considered to present a significant risk with respect to that type of hazard.

The health hazards for which the risk was rated greater than zero with respect to 1,1,2-trichloroethane included:

Acute lethality, which is the hazard of death from a single dose, scored 2 with a concern level of 6. The score was based on the results of tests on mice, fish and insects.

Sub-lethal effects such as changes in rate of growth or of bodily functions, may be noted in tests on animals, both mammals and non-mammals, or on plants. 1,1,2-trichloroethane caused an increase in the weight of, and damage to, the livers of mice. These effects were considered serious enough to score sub-lethal effects on mammals at 6 against a concern level of 4.

Mutagenicity, the potential for causing genetic changes, was shown in some but not in all of the studies done. The mutagenicity of this chemical was scored at 6, just at the concern level.

Carcinogenicity, the capability of a substance to cause cancer was scored at 2 which is the concern level for this hazard. This score was based on the results of tests which showed that 1,1,2-trichloroethane was capable of causing cancer in mice, although the results of tests on rats were negative.

OTHER HAZARDOUS PROPERTIES OF 1,1,2-TRICHLOROETHANE

According to Regulation 309 a waste is considered hazardous if it exhibits at least one of the following characteristics; corrosiveness, ignitability, reactivity, or leachate toxicity. None of these are exhibited by 1,1,2-trichloroethane. Nevertheless because of the scores noted above, some aspects of its environmental behaviour become of concern when the disposal of wastes containing it is considered.

Characteristics of environmental behaviour significant in waste management can be identified and scores assigned.

Environmental mobility refers to the dispersion of a material in water and in air. 1,1,2-trichloroethane being both soluble in water and volatile, receives a score of 10 for mobility against a concern level of 7.

Environmental persistence of a pollutant is a measure of the length of time before the substance degrades to some less harmful compounds or elements. 1,1,2-trichloroethane is broken down in air, under conditions of bright sunlight, in about 41 hours but it has a half-life in water solution, (pH 7.0), estimated at 37 years. Due largely to its persistence in water its environmental persistence is scored at 10. The concern level for this characteristic is 7.

Environmental exposure is a measure of the potential that humans or other organisms will come into contact with a hazardous waste. Because of its high volatility, exposure to 1,1,2-trichloroethane through atmospheric pathways is not a general concern. Localized air pollution problems, however may result through the improper disposal of wastes containing the chemical solvent at a landfill site.

The potential for human exposure to the presence of 1,1,2-trichloroethane in groundwater used for drinking is more serious; particularly if the groundwater supply is near a landfill site with leachate problems. The risk is increased by the fact that the solvent is known to be capable of degrading the synthetic bottom liners used in some landfill sites to prevent ground water pollution.

In combination these risks are judged to warrant a score of 7, just at the concern level for environmental exposure.

CURRENT REGULATORY CONTROLS

1,1,2-trichloroethane is currently listed as a hazardous waste chemical in Schedule 2 of Regulation 309. This schedule includes hazardous chemical products or intermediates that become waste because they are off-specification or are otherwise unacceptable for use.

The use of this solvent is also regulated under the Workplace Hazardous Materials Information System (WHMIS) Regulations of the Ontario *Occupational Health and Safety Act*, administered by the Ministry of Labour. The regulations prescribe the safety measures to be taken by workers in using the chemical.

CONCLUSIONS AND RECOMMENDATIONS

It is concluded that 1,1,2-trichloroethane presents a serious risk to the environment because it may have the potential to cause human cancer and because of its demonstrated mutagenic effects. These considerations, together with its environmental mobility and persistence, justify the recommendation that it should be listed in Schedule 1 of Regulation 309, of Ontario's *Environmental Protection Act*.

For more Information contact:

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